

# INTRODUCTION

The Office of Environmental Management (EM) is responsible for cleaning up the legacy of radioactive and chemically hazardous waste at contaminated sites and facilities throughout the U.S. Department of Energy (DOE) nuclear weapons complex, preventing further environmental contamination, and instituting responsible environmental management. Initial efforts to achieve this mission resulted in the establishment of environmental restoration and waste management programs. However, as EM began to execute its responsibilities, decision-makers became aware that the complexity and magnitude of this mission could not be achieved efficiently, affordably, safely, or reasonably with existing technology.

Once the need for advanced cleanup technologies became evident, EM established an aggressive, innovative program of applied research and technology development. The Office of Technology Development (OTD) was established in November 1989 to advance new and improved environmental restoration and waste management technologies that would reduce risks to workers, the public, and the environment; reduce cleanup costs; and devise methods to address environmental cleanup problems that currently have no solutions.

In 1996, OTD added two new responsibilities: management of a congressionally mandated environmental science program and development of risk policy requirements and guidance. OTD was renamed the Office of Science and Technology (OST).

## THE ENVIRONMENTAL MANAGEMENT ORGANIZATION

OST is one of seven Deputy Assistant Secretarial Offices within EM. A brief description of each Deputy Assistant Secretarial Office is presented below. Since the Characterization, Monitoring, and Sensor Technology Crosscutting Program (CMST-CP) is a part of OST, the latter is described in more detail in a separate section.

### Office of the Assistant Secretary for Environmental Management

The Assistant Secretary for Environmental Management provides centralized direction for waste management operations, environmental restoration, and related applied research and development programs and activities within DOE.

### Office of Management and Evaluation

The Deputy Assistant Secretary for Management and Evaluation serves as the principal advisor on all administrative functions and activities for EM line offices.

### Office of Planning, Policy, and Budget

This office provides support on policy and planning issues associated with environmental compliance and cleanup activities, waste management, nuclear materials and facilities stabilization, overall budget and priority setting analyses, nuclear non-proliferation policy practices, and the disposition of surplus materials and facilities.

### Office of Waste Management

This office provides an effective and efficient system that minimizes, treats, stores, and disposes of DOE waste as soon as possible in order to protect people and the environment from the hazards of those wastes.

### Office of Environmental Restoration

This office is responsible for remediating DOE sites and facilities to protect human health and the environment from the risks posed by inactive and surplus DOE facilities and for restoring contaminated areas for future beneficial use.

### **Office of Nuclear Material and Facility Stabilization**

This office is responsible for protecting people and the environment from the hazards of nuclear materials and for the deactivation of surplus DOE facilities in a cost-effective manner.

### **Office of Site Operations**

This office serves as the facilitator, coordinator, and ombudsman for crosscutting environment, transportation management, and waste minimization activities.

## **OFFICE OF SCIENCE AND TECHNOLOGY (OST)**

OST supports EM by using a systems approach to manage and direct focused, solution-oriented national technology development programs to reduce waste management life-cycle costs and risks to people and the environment. OST programs involve research, development, demonstration, testing, and evaluation of innovative technologies and technology systems to provide solutions to user needs and satisfy regulatory requirements. Activities include coordination with stakeholders and the private sector, as well as collaboration with international organizations.

OST programs establish, direct, and manage targeted, intermediate-term research bridging the gap between broad fundamental research that has wide-ranging applications and needs-driven applied technology development. Through integration of basic research and applied research and development, as conducted by the Focus Areas, Crosscutting Programs, and University and Industry Programs, and through its technology integration activities, OST expects to produce and deliver technology solutions for the major needs of its EM customers.

The Focus Areas, Crosscutting Programs, Industry and University Programs, and the Technology Integration Program strive to involve private sector technology providers and commercial users in developing and improving technologies that address site needs. These programs also work with interested parties, stakeholders, and public interest groups in assessing the acceptability, availability, and use of improved technical solutions. They provide uniform guidance, facilitate technology transfer, and ensure that the needs of stakeholders are integrated into the decision-making process.

OST is comprised of the following three offices:

### **Office of Science and Risk Policy**

This office manages the EM Science Program and the formulation of risk policy. The mission of this office includes the development of a targeted, long-term basic research agenda for environmental problems so that “transformational” or breakthrough approaches can lead to significant reductions in the costs and risks associated with the EM program. The Office of Science and Risk Policy also bridges the gap between broad fundamental research that has wide-ranging applicability, such as that performed in the DOE Office of Energy Research and the needs-driven applied technology development that is conducted by the EM Office of Technology Systems. The Office of Science and Risk Policy was designed to focus the national science infrastructure on critical national environmental management problems. Risk policy activities within the office involve the development of policies, procedures, and guidance to ensure that EM activities in eliminating or mitigating risks to the public, workers, and the environment are within prescribed, acceptable levels.

### **Office of Technology Systems**

This office conducts research, development, demonstration, testing, and evaluation activities designed to produce innovative environmental restoration and waste management technologies and technology systems to meet national needs for regulatory compliance, lower life-cycle costs, and risk reduction.

In 1994, OST identified five major problem areas on which to focus its technology development activities, and implemented Focus Areas to address these problems. By 1998, the Focus Areas had been

redefined by combining two Focus Areas related to soil and groundwater and creating a new Nuclear Materials Focus Area. The five current Focus Areas are:

- **Subsurface Contaminants.** The Subsurface Contaminants Focus Area provides new or improved technologies to address environmental problems associated with hazardous and radioactive contaminants in soil and groundwater. Over 600 billion gallons of groundwater and 50 million cubic meters of soil are contaminated at more than 5,700 locations on DOE sites. The contaminants include radionuclides, heavy metals, and hazardous organic compounds. The migration of certain contaminants threatens water resources and, in some cases, has already had an adverse effect on off-site locations. Emphasis is placed on the development of *in situ* technologies to minimize remediation costs and potential worker exposures, to improve capabilities for landfill containment, and to implement effective and reliable subsurface barriers to contaminant migration.
- **Mixed Waste Characterization, Treatment, and Disposal.** The Mixed Waste Characterization, Treatment, and Disposal Focus Area provides new or improved treatment systems for mixed radioactive and hazardous chemical waste, and processes for the disposal of low-level and transuranic waste in a manner that meets regulatory requirements. There are over 167,000 cubic meters of mixed, low-level, and transuranic wastes from over 1,400 mixed radioactive and hazardous chemical waste streams at 38 DOE sites. Emphasis is placed on developing cost-effective monitoring systems, waste volume reduction, and safe permanent disposal.
- **High-Level Tank Waste Remediation.** The Tanks Focus Area provides new or improved technologies to safely and efficiently remediate over 300 underground storage tanks that have been used to process and store more than 100 million gallons of high-level radioactive and hazardous chemical mixed waste. Technologies are needed to characterize, retrieve, and treat the waste before radioactive components are immobilized. All this must be done in a safe working environment. Emphasis is placed on *in situ* or remotely handled processes and waste volume minimization. Research and development of technologies in this area is aimed at enabling tank farm closure using safe and cost-efficient solutions that are acceptable to the public and fulfill the requirements of site regulatory agreements under the Federal Facility Compliance Act.
- **Deactivation and Decommissioning.** The Deactivation and Decommissioning Focus Area provides new or improved technologies to deactivate 7,000 contaminated buildings and decommission 700 buildings. This includes decontaminating the metal and concrete within those buildings and disposing of over 180,000 metric tons of scrap metal. This Focus Area emphasizes large-scale demonstrations, each of which incorporates improved technologies identified as responsive to high-priority needs. Such demonstrations also include existing commercial technologies to provide a basis for comparison of costs and effectiveness.
- **Nuclear Materials.** The Nuclear Materials Focus Area (formerly the Plutonium Focus Area) provides new or improved technologies for safe and effective long-term storage of nuclear materials including impure plutonium oxides, interim storage of stabilized plutonium residues pending disposition to the Waste Isolation Pilot Plant (WIPP), and safety surveillance for long-term plutonium and other long-lived nuclear material storage.

Three major Crosscutting Programs address technology development needs that are common to the Focus Areas. The three Crosscutting Programs are:

- **Characterization, Monitoring, and Sensor Technology.** This program develops or improves sensors, monitors, and site and waste characterization technologies to improve worker safety, lower costs, and enable operations where no technology currently exists for use during cleanup activities and site remediation, waste treatment and disposal, and facility deactivation and decontamination.
- **Efficient Separations and Processing.** This program evaluates and adapts existing technologies to the needs of the Focus Areas and develops needed treatment and separation processes where none exist.

- **Robotics Technology Development.** This program develops robotic systems to minimize worker exposure while providing proven, cost-effective and, in some cases, the only acceptable approach to problems.

To optimize resources, the Office of Technology Systems has streamlined technology management activities under a single team for each Focus Area. To ensure that its programs are based on user needs, the teams include representatives from user offices within EM.

#### **Office of Technology Integration**

The Office of Technology Integration addresses issues that affect the involvement of critical external entities such as production/waste sites, users, the public, tribes, regulators, and commercial parties. This office is involved in the assessment, acceptability, availability, and use of improved technical solutions by providing uniform guidance, tools, and initiatives to support OST. The Office of Technology Integration sponsors efforts to encourage and promote the involvement of affected parties in the regulatory issues. It also sponsors domestic and international technology transfer activities and coordinates planning and cost-benefit analyses with other EM organizations.